

What is claimed is:

1. An electronically tunable multiple band antenna, comprising:
 - a high band antenna with at least one tunable element associated therewith, said high band antenna providing a first input to a controller;
 - a low band antenna with at least one tunable element associated therewith, said low band antenna providing a second input to said controller; and
 - 10 said controller further receiving control data and controlling a first bias for biasing said at least one tunable element associated with said high band antenna and a second bias for biasing said at least one tunable element associated with said low band antenna.
2. The electronically tunable multiple band antenna of claim 1,
15 further comprising a DC voltage supply provided to said controller.
3. The electronically tunable multiple band antenna of claim 1,
wherein said high band antenna further comprises:
 - 20 a substrate;
 - a patch element on said substrate;
 - at least one voltage tunable varactor associated with said patch element;
 - 25 a DC bias point on said patch element; and

an RF input on said patch element.

5

4. The electronically tunable multiple band antenna of claim 3, wherein said high band antenna further comprises a temperature sensor associated with said high band pass antenna.

10

5. The electronically tunable multiple band antenna of claim 3, wherein said high band antenna further comprises a ground plane on one side of said substrate.

15

6. The electronically tunable multiple band antenna of claim 1, wherein said low band antenna further comprises:

a substrate;

a patch element on said substrate;

at least one voltage tunable varactor associated with said patch

element;

a DC bias point on said patch element; and

an RF input on said patch element.

20

7. The electronically tunable multiple band antenna of claim 3, wherein said low band antenna further comprises a temperature sensor associated with said low band pass antenna.

8. The electronically tunable multiple band antenna of claim 3, wherein said low band antenna further comprises a ground plane on one side of said substrate.

5 9. The electronically tunable multiple band antenna of claim 1, wherein said multiple band antenna is a quad band antenna.

10 10. The electronically tunable multiple band antenna of claim 9, wherein said control data is information to enable tuning for reception and transmission of predetermined frequency bands.

15 11. The electronically tunable multiple band antenna of claim 10, wherein said quad band antenna covers the following frequency bands and standards: 824 - 894 MHz; 880 - 960 MHz; 1710 -1880 MHz; 1850 - 1990Hz; GSM850; EGSM; GSM 1800; and PCS 1900.

12. A method of transmitting and receiving RF signals from multiple frequency bands utilizing an electronically tunable multiple band antenna, comprising the steps of:

20 providing a high band antenna with at least one voltage tunable varactor associated therewith, said high band antenna providing a first input to a controller;

providing a low band antenna with at least one voltage tunable varactor associated therewith, said low band antenna providing a second input to said controller; and

5 inputting control data to said controller and controlling a first bias voltage for biasing said at least one voltage tunable varactor associated with said high band antenna and a second bias voltage for biasing said at least one voltage tunable varactor associated with said low band antenna.

10 13. The method of transmitting and receiving RF signals from multiple frequency bands utilizing an electronically tunable multiple band antenna of claim 12, further comprising providing a DC voltage supply to said controller.

15 14. The method of transmitting and receiving RF signals from multiple frequency bands utilizing an electronically tunable multiple band antenna of claim 12, wherein said high band antenna further comprises:

20 a substrate;
a patch element on said substrate;
at least one voltage tunable varactor associated with said patch element;
a DC bias point on said patch element; and
an RF input on said patch element.

15. The method of transmitting and receiving RF signals from multiple frequency bands utilizing an electronically tunable multiple band antenna of claim 12 wherein said high band antenna further comprises a temperature sensor associated with said high band pass antenna.

5

16. The method of transmitting and receiving RF signals from multiple frequency bands utilizing an electronically tunable multiple band antenna of claim 12, wherein said high band antenna further comprises a ground plane on one side of said substrate.

10

17. The method of transmitting and receiving RF signals from multiple frequency bands utilizing an electronically tunable multiple band antenna of claim 12, wherein said low band antenna further comprises:

a substrate;

15 a patch element on said substrate;

at least one voltage tunable varactor associated with said patch element;

a DC bias point on said patch element; and

an RF input on said patch element.

20

18. The method of transmitting and receiving RF signals from multiple frequency bands utilizing an electronically tunable multiple band antenna

of claim 12, wherein said low band antenna further comprises a temperature sensor associated with said low band pass antenna.

5 19. The method of transmitting and receiving RF signals from multiple frequency bands utilizing an electronically tunable multiple band antenna of claim 12, wherein said low band antenna further comprises a ground plane on one side of said substrate.

10 20. The method of transmitting and receiving RF signals from multiple frequency bands utilizing an electronically tunable multiple band antenna of claim 12, wherein said multiple band antenna is a quad band antenna.

15 21. The method of transmitting and receiving RF signals from multiple frequency bands utilizing an electronically tunable multiple band antenna of claim 20, wherein said quad band antenna covers the following frequency bands and standards: 824 - 894 MHz; 880 - 960 MHz; 1710 - 1880 MHz; 1850 - 1990Hz; GSM850; EGSM; GSM 1800; and PCS 1900.

20 22. An electronically tunable quad-band antenna, comprising:
a tunable high band antenna tuned by at least one tunable varactor associated therewith;

said tunable high band antenna further comprising:

a substrate;

a patch element on said substrate;
at least one voltage tunable varactor associated with said
patch element;
a DC bias point on said patch element;
an RF input on said patch element; and
a temperature sensor associated with said high band pass
antenna;
a tunable low band antenna tuned by at least one tunable varactor
associated therewith
said tunable low band antenna further comprising:
a substrate;
a patch element on said substrate;
at least one voltage tunable varactor associated with said
patch element;
a DC bias point on said patch element;
an RF input on said patch element; and
a temperature sensor associated with said low band pass
antenna;
a controller receiving control data, output information from said
low band antenna and output information from said high band antenna and
controlling a first bias voltage for biasing said at least one voltage tunable
varactor associated with said high band antenna and a second bias voltage

for biasing said at least one voltage tunable varactor associated with said low band antenna.

5 23. The electronically tunable quad-band antenna of claim 22, wherein said first and second bias voltages are provided by a DC to DC converter regulator.

10 24. The electronically tunable quad-band antenna of claim 22, wherein said quad band antenna covers the following frequency bands and standards: 824 - 894 MHz; 880 - 960 MHz; 1710 -1880 MHz; 1850 -

1990Hz; GSM850; EGSM; GSM 1800; and PCS 1900.